

The invention claimed is:

1. A process for removing paint from an at least partially coated plastic substrate comprising the steps of:

providing a plastic substrate at least partially coated with a coating;

immersing the at least partially coated plastic substrate into a first fluid mix comprising at least one organic solvent, a surfactant, an accelerator, a paint-thinning solvent, a coupling agent, and water;

immersing the at least partially coated plastic substrate into a second fluid mix comprising an ether chosen from the group consisting of ethylene glycol monoethyl ether and ethylene glycol diethyl ether, and at least one dibasic ester, and optionally agitating the at least partially coated plastic substrate;

immersing the at least partially coated plastic substrate into a third fluid mix comprising an ether chosen from the group consisting of ethylene glycol monoethyl ether and ethylene glycol diethyl ether, and at least one dibasic ester, and optionally agitating the at least partially coated plastic substrate;

rinsing the plastic substrate with water; and

drying the plastic substrate.

2. The process for removing paint from an at least partially coated substrate of claim 1, wherein the plastic substrate comprises a plastic substrate selected from the group comprising nylon, polypropylene, polyphenylene oxide (PPO), polyethylene, polyamide and polyphenylene ether (PPE), polycarbonate, thermoplastic polyolefins, polyphenylene oxide (PPO), polyamide (PA), polyphenylene ether (PPE), thermoplastic urethanes, blended nylon, polyvinyl chloride, high impact polystyrenes, and mixtures thereof, and wherein a first fluid retaining device retains the first fluid mix, a second fluid retaining device retains the second fluid mix, and third fluid retaining device retains the optional third fluid mix, and wherein the at least partially coated plastic substrate is removed from the first fluid retaining device prior to being immersed in the

second fluid retaining device, and the at least partially coated plastic substrate is removed from the second fluid retaining device prior to being immersed in the third fluid retaining device.

3. The process for removing paint from an at least partially coated substrate of claim 2, wherein the organic solvent comprises benzyl alcohol.

4. The process for removing paint from an at least partially coated substrate of claim 3, wherein the surfactant comprises sodium lauryl sulfate.

5. The process for removing paint from an at least partially coated substrate of claim 4, wherein the accelerator comprises 2-mercaptobenzothiazole.

6. The process for removing paint from an at least partially coated substrate of claim 5, wherein the paint-thinning solvent comprises xylene.

7. The process for removing paint from an at least partially coated substrate of claim 6, wherein the coupling agent comprises glycolic acid.

8. The process for removing paint from an at least partially coated substrate of claim 2, wherein the ether chosen from the group consisting of ethylene glycol monoethyl ether or ethylene glycol diethyl ether comprises dipropylene glycol dimethyl ether.

9. The process for removing paint from an at least partially coated substrate of claim 8, wherein the dibasic ester comprises at least one dibasic ester selected from the group comprising DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester.

10. The process for removing paint from an at least partially coated substrate of claim 2, wherein the third fluid mix comprises dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester.

11. A process for removing paint from an at least partially coated plastic substrate comprising the steps of:

providing a plastic substrate at least partially coated with a coating;

immersing the at least partially coated plastic substrate into a first fluid mix comprising at least one organic solvent, a surfactant, an accelerator, a paint-thinning solvent, a coupling agent, and water, and optionally agitating the at least partially coated plastic substrate, and wherein the fluid comprises a temperature of about 140 F to about 180 F;

immersing the at least partially coated plastic substrate into a second fluid mix comprising an ether chosen from the group consisting of ethylene glycol monoethyl ether and ethylene glycol diethyl ether, and at least one dibasic ester, and wherein the second fluid comprises a temperature of about 68 F to about 120 F;

rinsing the plastic substrate with water; and

drying the plastic substrate.

12. The process for removing paint from an at least partially coated substrate of claim 11, wherein the plastic substrate comprises a plastic substrate selected from the group comprising nylon, polypropylene, polyphenylene oxide (PPO), polyethylene, polyamide and polyphenylene ether (PPE), polycarbonate, thermoplastic polyolefins, polyphenylene oxide (PPO), polyamide (PA), polyphenylene ether (PPE), thermoplastic urethanes, blended nylon, polyvinyl chloride, high impact polystyrenes, and mixtures thereof, and wherein a first fluid retaining device retains the first fluid mix, and a second fluid retaining device retains the second fluid mix, and wherein the at least partially coated plastic substrate is removed from the first fluid retaining device prior to being immersed in the second fluid retaining device.

13. The process for removing paint from an at least partially coated substrate of claim 12, wherein the organic solvent comprises benzyl alcohol.
14. The process for removing paint from an at least partially coated substrate of claim 13, wherein the surfactant comprises sodium lauryl sulfate.
15. The process for removing paint from an at least partially coated substrate of claim 14, wherein the accelerator comprises 2-mercaptobenzothiazole.
16. The process for removing paint from an at least partially coated substrate of claim 15, wherein the paint-thinning solvent comprises xylene.
17. The process for removing paint from an at least partially coated substrate of claim 16, wherein the coupling agent comprises glycolic acid.
18. The process for removing paint from a at least partially coated substrate of claim 17, wherein the first fluid comprises from about 50% to about 55% by weight benzyl alcohol, from about 0.5% to 1.5% by weight sodium lauryl sulphate, from about 0.5% to about 1% by weight 2-mercaptobenzothiazole, from about 30% to about 40% by weight water, from about 0.1% to about 1% by weight xylene, and from about 5% to about 10% by weight glycolic acid.
19. The process for removing paint from an at least partially coated substrate of claim 12, wherein the ethylene glycol monoethyl ether or ethylene glycol diethyl ether comprises dipropylene glycol dimethyl ether.
20. The process for removing paint from an at least partially coated substrate of claim 19, wherein the dibasic ester comprises at least one dibasic ester selected from

the group comprising DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester.

21. The process for removing paint from an at least partially coated substrate of claim 20, wherein the second fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-6 dibasic ester.

22. A process for removing paint from an at least partially coated plastic substrate comprising the steps of:

providing a plastic substrate at least partially coated with a coating;

immersing the at least partially coated plastic substrate into a first fluid mix comprising benzyl alcohol, sodium lauryl sulphate, 2-mercaptobenzothiazole, xylene, glycolic acid, and water;

immersing the at least partially coated plastic substrate into a second fluid mix comprising dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester, and optionally agitating the at least partially coated plastic substrate;

rinsing the plastic substrate with water; and

drying the plastic substrate.

23. The process for removing paint from an at least partially coated substrate of claim 22, wherein the plastic substrate comprises a plastic substrate selected from the group comprising nylon, polypropylene, polyphenylene oxide (PPO), polyethylene, polyamide and polyphenylene ether (PPE), polycarbonate, thermoplastic polyolefins, polyphenylene oxide (PPO), polyamide (PA), polyphenylene ether (PPE), thermoplastic urethanes, blended nylon, polyvinyl chloride, high impact polystyrenes, and mixtures thereof, and wherein a first fluid retaining device retains the first fluid mix, and a

second fluid retaining device retains the second fluid mix, and wherein the at least partially coated plastic substrate is removed from the first fluid retaining device prior to being immersed in the second fluid retaining device.

24. The process for removing paint from an at least partially coated substrate of claim 23, wherein the first fluid mix comprises from about 50% to about 55% by weight benzyl alcohol, from about 0.5% to 1.5% by weight sodium lauryl sulphate, from about 0.5% to about 1% by weight 2-mercaptobenzothiazole, from about 30% to about 40% by weight water, from about 0.1% to about 1% by weight xylene, and from about 5% to about 10% by weight glycolic acid and wherein the first fluid mix comprises a temperature of about 140 F to about 180 F.

25. The process for removing paint from an at least partially coated substrate of claim 23, wherein the second fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-6 dibasic ester, and wherein the second fluid mix comprises a temperature of about 68 F to about 120 F.

26. A process for recycling liquid waste, solid waste, and plastic substrates produced according to the following:

providing a plastic substrate at least partially coated with a coating;

immersing the at least partially coated plastic substrate into a first fluid comprising benzyl alcohol, sodium lauryl sulfate, 2-mercaptobenzothiazole, xylene, and glycolic acid, and wherein the first fluid comprises a temperature of about 140 F to about 180 F;

immersing the at least partially coated plastic substrate into a second fluid comprising dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester, and wherein the second fluid comprises a temperature

of about 68°F to about 120°F;

optionally immersing the at least partially coated plastic substrate into a third fluid comprising dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester, and wherein the third fluid comprises a temperature of about 68 F to about 120 F;

removing the plastic substrate from the optional third fluid;

rinsing the plastic substrate with water;

drying the plastic substrate;

collecting the plastic substrate for reuse;

collecting the fluid comprising liquid and solid wastes produced by the process for removing paint from an at least partially coated plastic substrate;

neutralizing the liquid and solid wastes by adding sodium hydroxide;

evaporating the neutralized liquid waste; and

safely disposing the evaporated neutralized liquid waste and neutralized solid waste.

27. The process for recycling liquid waste, solid waste, and plastic substrates of claim 26, wherein the plastic substrate comprises a plastic substrate selected from the group comprising nylon, polypropylene, polyphenylene oxide (PPO), polyethylene, polyamide and polyphenylene ether (PPE), polycarbonate, thermoplastic polyolefins, polyphenylene oxide (PPO), polyamide (PA), polyphenylene ether (PPE), thermoplastic urethanes, blended nylon, polyvinyl chloride, high impact polystyrenes, and mixtures thereof, and wherein a first fluid retaining device retains the first fluid mix, a second fluid retaining device retains the second fluid mix, and an optional third fluid retaining device retains the optional third fluid mix, and wherein the at least partially coated plastic substrate is removed from the first fluid retaining device prior to being immersed in the second fluid retaining device, and the at least partially coated plastic substrate is removed from the second fluid retaining device prior to being immersed in the optional third fluid retaining device.

28. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein the first fluid comprises from about 50% to about 55% by weight benzyl alcohol, from about 0.5% to 1.5% by weight sodium lauryl sulphate, from about 0.5% to about 1% by weight 2-mercaptobenzothiazole, from about 30% to about 40% by weight water, from about 0.1% to about 1% by weight xylene, and from about 5% to about 10% by weight glycolic acid.

29. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein the second fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-6 dibasic ester.

30. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein the optional third fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-6 dibasic ester.

31. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein prior to immersing the at least partially coated plastic substrate into the first fluid, the size of the at least partially coated plastic substrate is reduced using a mechanical device.

32. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein after drying the size of the dried plastic substrate is reduced using a mechanical device.



33. The process for recycling liquid waste, solid waste, and plastic substrates of claim 27, wherein the dried plastic substrate is melted.

34. A recycled plastic substrate product produced according to the following process:

- providing a plastic substrate at least partially coated with a coating;

- immersing the at least partially coated plastic substrate into a first fluid mix comprising benzyl alcohol, sodium lauryl sulfate, 2-mercaptobenzothiazole, xylene, and glycolic acid, and wherein the first fluid mix comprises a temperature of about 140 F to about 180 F;

- removing the at least partially coated plastic substrate from the first fluid;

- immersing the at least partially coated plastic substrate into a second fluid mix comprising dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester, and wherein the second fluid mix comprises a temperature of about 68 F to about 120 F;

- removing the at least partially coated plastic substrate from the second fluid;

- optionally immersing the at least partially coated plastic substrate into a third fluid mix comprising substantially the same chemicals as in the second fluid, and wherein the third fluid mix is at a temperature comprising about 68 F to about 120 F;

- removing the plastic substrate from the optional third fluid;

- rinsing the plastic substrate with water;

- drying the plastic substrate; and

- collecting the plastic substrate for reuse.

35. A recycled plastic substrate product of claim 34, wherein the plastic substrate comprises a plastic substrate selected from the group comprising nylon, polypropylene, polyphenylene oxide (PPO), polyethylene, polyamide and polyphenylene ether (PPE), polycarbonate, thermoplastic polyolefins, polyphenylene oxide (PPO), polyamide (PA), polyphenylene ether (PPE), thermoplastic urethanes, blended nylon, polyvinyl chloride,

high impact polystyrenes, and mixtures thereof, and wherein a first fluid retaining device retains the first fluid mix, a second fluid retaining device retains the second fluid mix, and an optional third fluid retaining device retains the optional third fluid mix, and wherein the at least partially coated plastic substrate is removed from the first fluid retaining device prior to being immersed in the second fluid retaining device, and the at least partially coated plastic substrate is removed from the second fluid retaining device prior to being immersed in the optional third fluid retaining device.

36. The recycled plastic substrate product of claim 35, wherein the first fluid comprises from about 50% to about 55% by weight benzyl alcohol, from about 0.5% to 1.5% by weight sodium lauryl sulphate, from about 0.5% to about 1% by weight 2-mercaptobenzothiazole, from about 30% to about 40% by weight water, from about 0.1% to about 1% by weight xylene, and from about 5% to about 10% by weight glycolic acid.

37. The recycled plastic substrate product of claim 35, wherein the second fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-6 dibasic ester.

38. The recycled plastic substrate product of claim 35, wherein the optional third fluid mix comprises dipropylene glycol dimethyl ether, DBE-4 dibasic ester, DBE-5 dibasic ester, and DBE-6 dibasic ester.

39. The recycled plastic substrate product of claim 38, wherein the third fluid mix comprises from about 15% to about 25% by weight dipropylene glycol dimethyl ether, from about 55% to about 65% by weight DBE-4 dibasic ester, from about 1% to about 2% by weight DBE-5 dibasic ester, and from about 15% to about 25% by weight DBE-

6 dibasic ester.

40. The recycled plastic substrate product of claim 35, wherein prior to immersing the at least partially coated plastic substrate into the first fluid, the size of the at least partially coated plastic substrate is reduced using a mechanical device.

41. The recycled plastic substrate product of claim 35, wherein after drying the size of the dried plastic substrate is reduced using a mechanical device.

42. The recycled plastic substrate product of claim 35, wherein the dried plastic substrate is melted.